Starting Soon:
Tire Anti-Degradants Workshop

- ITRC's Tire Anti-Degradants (6PPD) Team
- CLU-IN training page at **http://www.clu-in.org/conf/itrc/6PPD/**. Under "Webinar Slides & References", you can download the slides

Use "Join Audio" option in lower left of Zoom webinar to listen to webinar
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Dial In 309 205 3325
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Housekeeping

- This event is being recorded; Training will be available On Demand after the event at the main training page
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Tire Anti-Degradants (6PPD) Workshop

Sponsored by: Interstate Technology & Regulatory Council (www.itrcweb.org)
Hosted by: US EPA Clean Up Information Network (www.clu-in.org)

Facilitators

Charles Reyes

ITRC Director

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Matt Potter

ALGA CEO

matthew@landandgroundwater.com

Expert Panelists

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ERM
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Interstate Technology & Regulatory Council (ITRC)

Charles Reyes, Director

ECOS

ERIS ENVIRONMENTAL RESEARCH INSTITUTE OF THE STATES

Who We Are

A state coalition to reduce regulatory barriers for the use of environmental cleanup technologies in the United States.

PURPOSE:

To advance innovative environmental decision making and solutions for a sustainable environment.

MISSION:

Develop innovative products and training to provide the knowledge and skills to

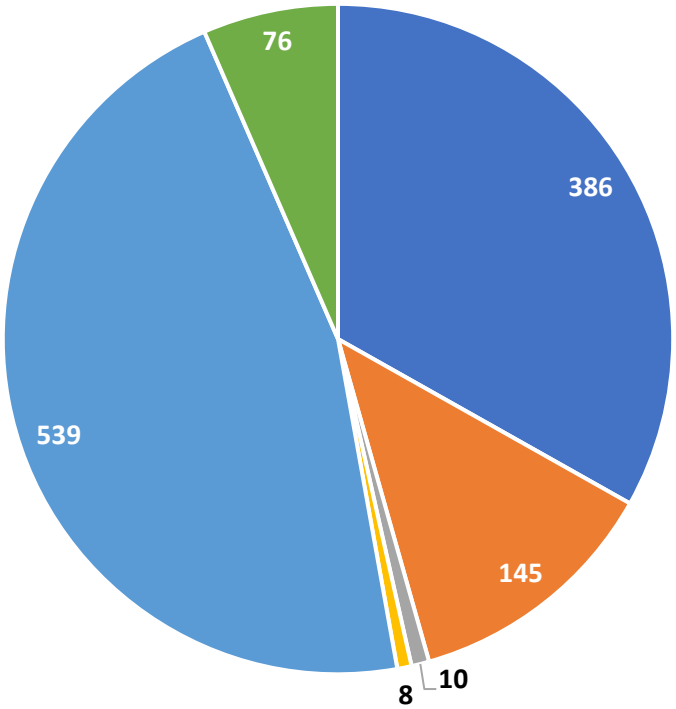
Established in 1995 and became a program of the Environmental Research Institute of the States (ERIS), an educational and research nonprofit corporation, in 2003.

- **ITRC Board of Advisors**
  - Voting Members (states)
  - Non-Voting Members (funding partners)
    - U.S. EPA, Department of Defense, Department of Energy, Industry
- **Programs**
  - Project and Training Teams
  - State Engagement Program
  - Industry Affiliates Program
  - Early Career Professionals
  - Stakeholder Outreach

ITRC Membership

State & Local Government	**386**
State Government	345
City/Local Government	41
U.S. Government	**145**
U.S. EPA	67
U.S. DOD	46
U.S. DOE	9
Other U.S. Federal Agency	23
Tribal Government	**10**
International Government	**8**
Private Sector	**539**
U.S. Industry	535
International Industry	4
Other	**76**
Academic	52
Public Stakeholder	14
Emeritus Stakeholder	10

1,164 Members*



Membership Details:
https://itrcweb.org/membership/details

Industry Affiliates Program:
https://itrcweb.org/membership/iap

Early Career Program:
https://itrcweb.org/membership/iap916

*August 2023

Project Teams

- PFAS
- Contaminants of Emerging Concern
- Managed Aquifer Recharge
- Ethylene Oxide Emissions
- Microplastics Outreach Toolkit
- Tire Anti-Degradants (6PPD)
- Passive Sampling Technology
- Reuse of Solid Waste Mining
- NEW: Vapor Intrusion
- NEW: Climate Workgroup

Team Descriptions:
https://itrcweb.org/teams/active

New 2024 Teams:
https://itrcweb.org/teams/new-teams

Completed Projects:
https://itrcweb.org/guidance

Training Activities

ITRC Training Webpage:
https://itrcweb.org/events/calendar

- **Upcoming Online Training**
- **In-Person Training Opportunities**
- **Archived Trainings**
- **YouTube Channel**

- Optimizing Injection Strategies and In Situ Remediation
- PFAS Introductory and Advanced Modules
- Pump & Treat Optimization
- Harmful Cyanobacterial Blooms (HCBs)
- Contaminants of Emerging Concern
- Sustainable Resilient Remediation
- Microplastics
- 1,4-Dioxane

Australasian Land and Groundwater Association (ALGA)

Matthew Potter, CEO

Association Snapshot

ALGA's purpose is to build and support leaders in the sustainable management of contaminated land and groundwater.

Established in 2007 as a vehicle for information sharing and professional development for individuals within the industry.

7 Board Directors
16 Branches
10 Specialist Interest Groups
10 Brains Trust Members
11 Honorary Life Members
Several administrative/governance and event committees

Association Comparison - Membership

Industry Sector	ALGA	ITRC	NICOLE
Consultant	59%	12%	25%
Contractor	12%	30%	16%
Regulator	12%	47%	1%
Property/Liability Owner	1%	-	24%
Academic / Research	2%	6%	29%
Laboratory	7%	1%	5%
Other*	7%	4%	-

**Note: Other - Public Stakeholder, Tribal Government, Planners, Legal Professionals*

Association Comparison - Membership

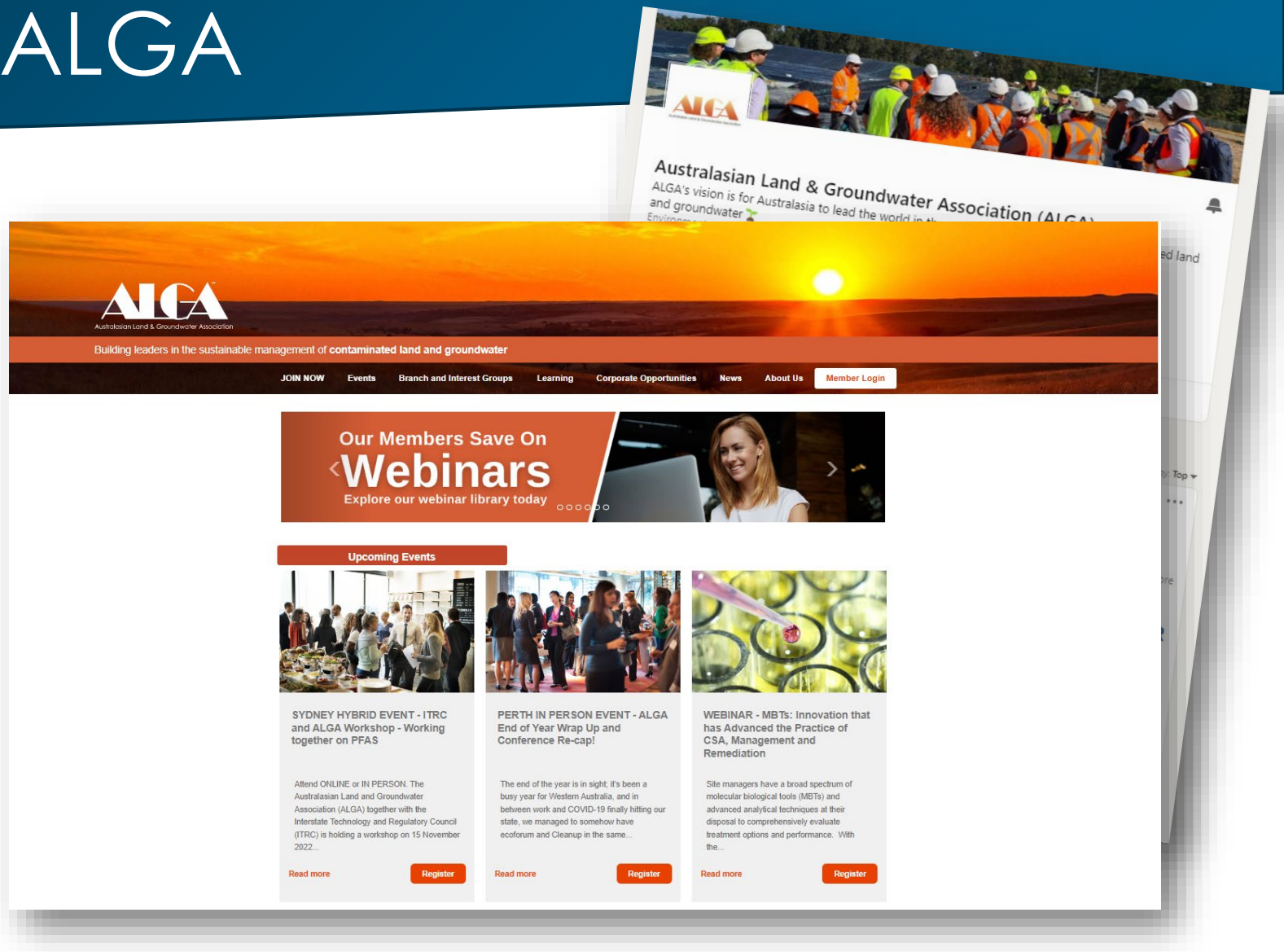
Specialist Interest Group	ALGA	ITRC	NICOLE
Air and Water Media	No	Yes	No
Asbestos	Yes	No	Yes
Early Career Professionals	Yes	Yes	Yes
Emerging Contaminants	Yes	Yes	Yes
Environmental Auditors	Yes	No	No
Foundation	No	No	Yes
Groundwater Fate and Transport	Yes	Yes	Yes
Harmful Algal Blooms	No	Yes	No
Land Stewardship	No	No	Yes
Local Government	Yes	Yes	Yes*
Mining Reuse	No	Yes	No
Regulatory	No	No	Yes
Risk Assessment	Yes	Yes	Yes
Soil Vapour and Ground Gas	Yes	Yes	No
Sustainable Remediation (SuRF)	Yes	No	Yes
Unexploded Ordnance	Yes	Yes	No

**Note: Via liaison with Common Forum (Network of European Environmental Regulators)*

Get Involved with ALGA

www.landandgroundwater.com

https://www.linkedin.com/company/australasian-land-&-groundwater-association

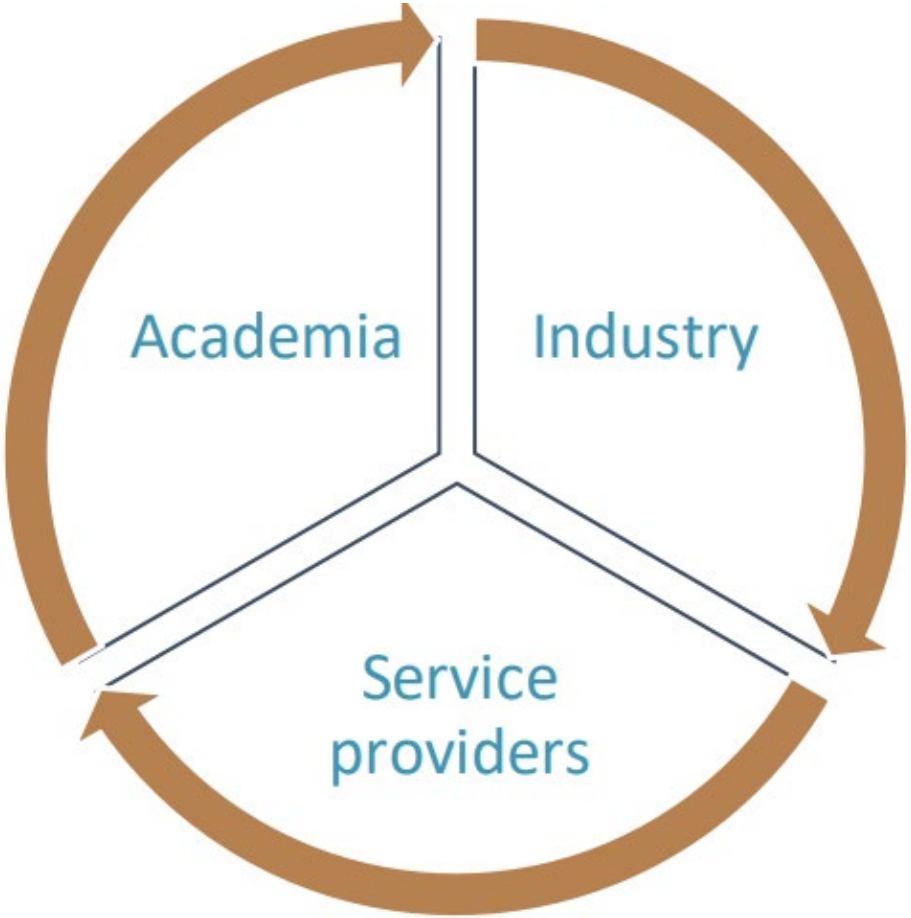


Networks for Industrially Co-ordinated Sustainable Land Management in Europe (NICOLE)

Sophie Claes, ERM

Who is NICOLE?

- Leading European network to develop and share state-of-the-art solutions for impaired land and related environmental concerns
- Focus on both liability management and value creation



- Network combining industry, service providers and academics, formed in 1996
- Fully funded by members (26 industry, 52 service providers, 32 academics)

Introduction of 6PPD & Setting the Stage of the Problem

Tanya Williams

Washington State Department of Ecology

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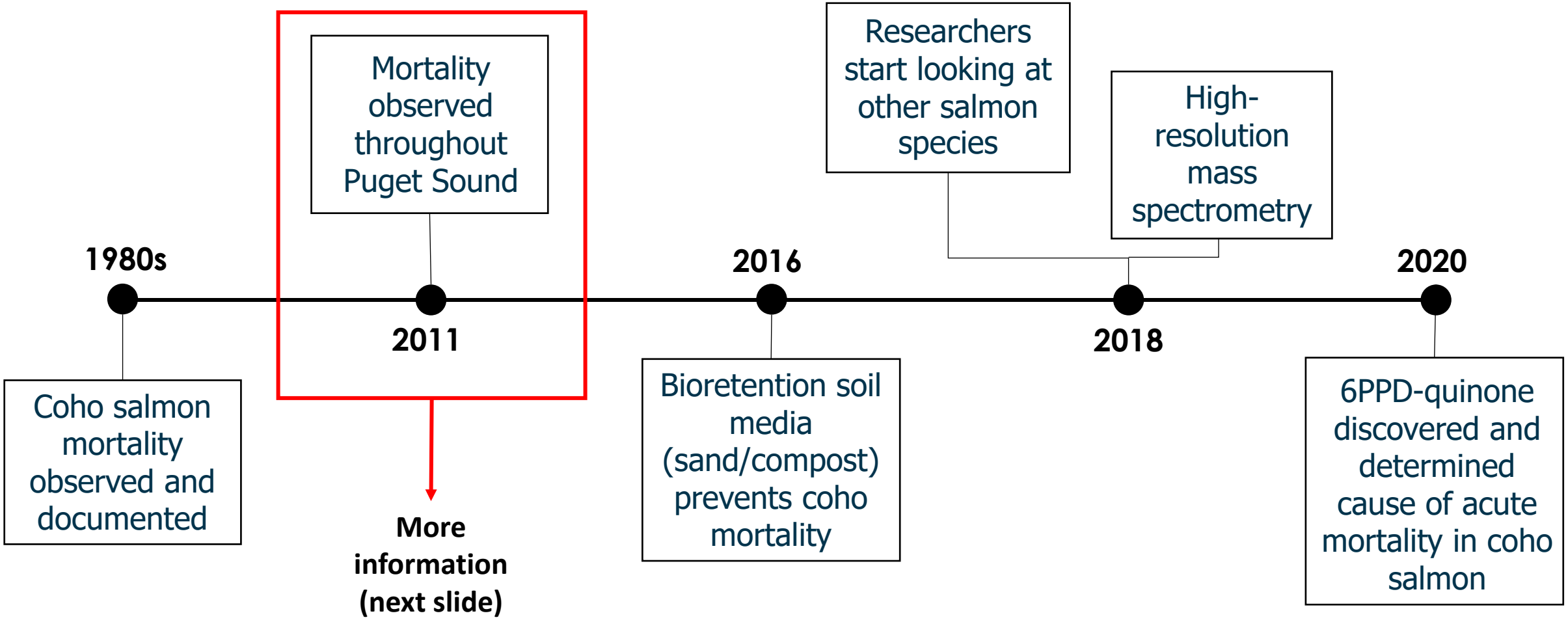
6PPD-quinone Discovery



Mortality Observed

- Up to 100% of coho salmon died before they could spawn
- Female carcasses showed >90% egg retention
- Symptoms: disorientation, swimming on side, gasping
- Hypothesized cause as road runoff

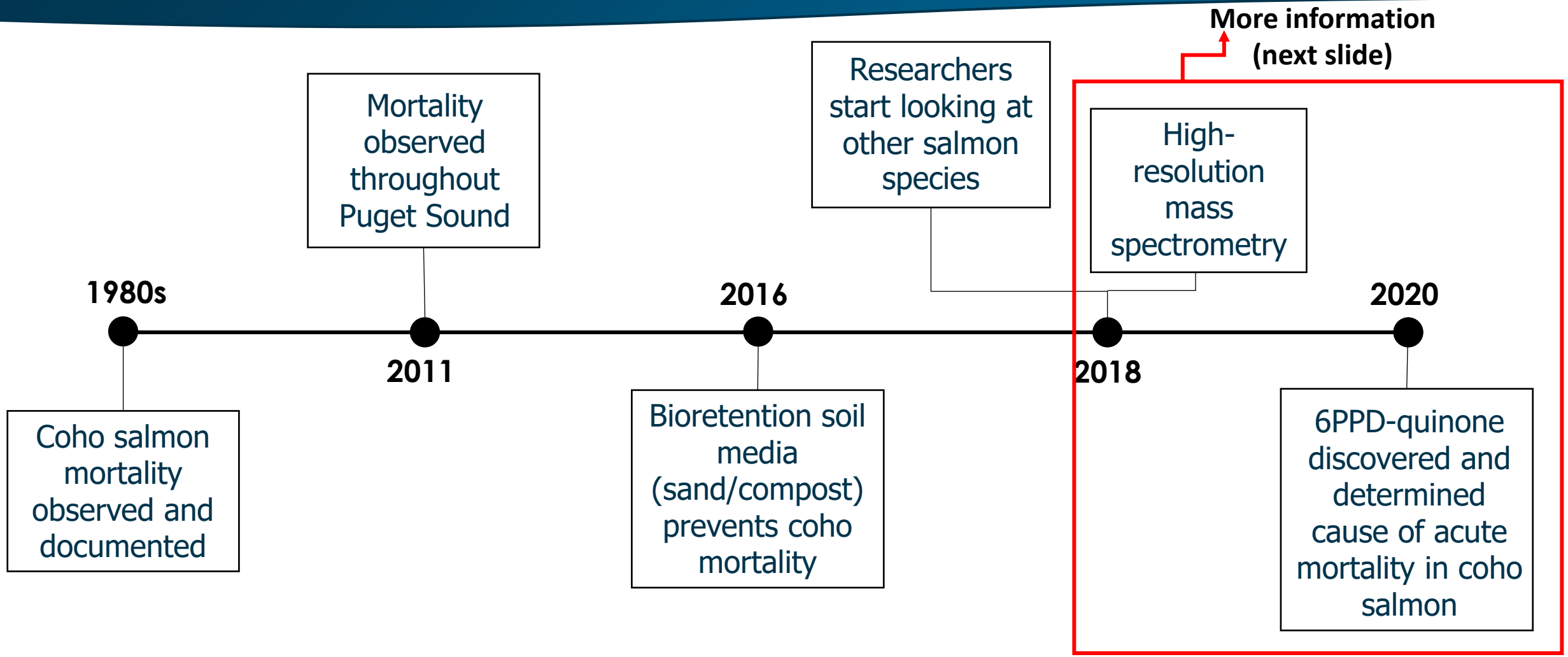
Scholz et al. 2011

Photo: Wild Fish Conservancy, 2021

Video: Longfellow Creek Coho Salmon

Video: Puget Soundkeeper

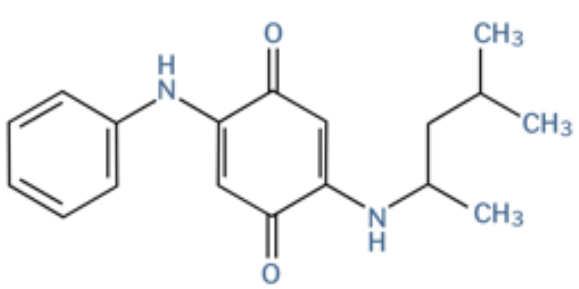
6PPD-quinone Discovery



Discovery of the Cause

6PPD-quinone

2-anilino-5-[(4-methylpentan-2-yl)amino]
cyclohexa-2,5-diene-1,4-dione



CASRN 2754428-18-5

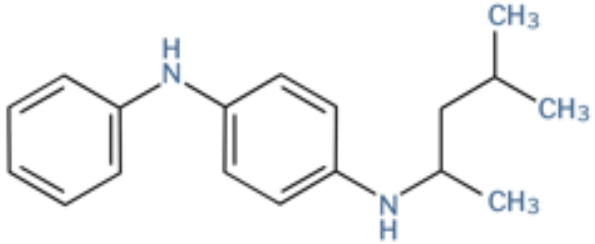
- Began research in 2018
- Over 2,000 chemicals in tire wear particle leachate
- High-Resolution Mass Spectrometry
- Fractionation processes based on chemical characteristics
- Discovered 6PPD-quinone in 2020

Source of 6PPD-quinone

- 6PPD
  - Chemical anti-degradant that prevents tire rubber from cracking when exposed to ozone
  - At tire surface, comes in contact with ozone
  - 6PPD and ozone reaction protects the tire, but also produces 6PPD-quinone

6PPD

1,4-Benzenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-



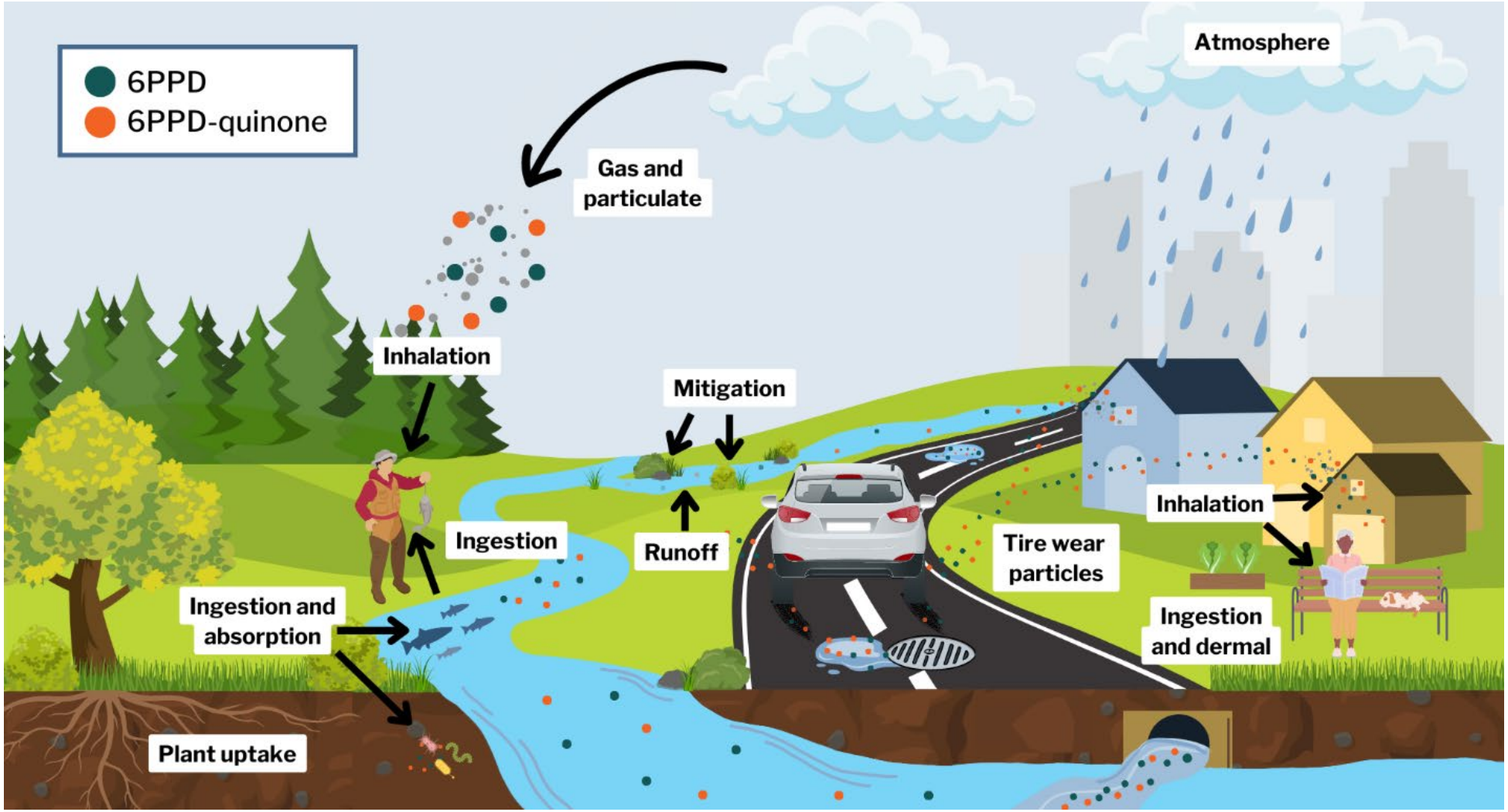
CASRN 793-24-8

With 6PPD

Without 6PPD

Photo credit: U.S. Tire Manufacturers Association

Conceptual exposure model



Finding 6PPD-q in the Environment

- High traffic locations
- Impervious surfaces
- Watershed characteristics
- Precipitation
- Dilution
- Flow rate
- Sensitive species locations

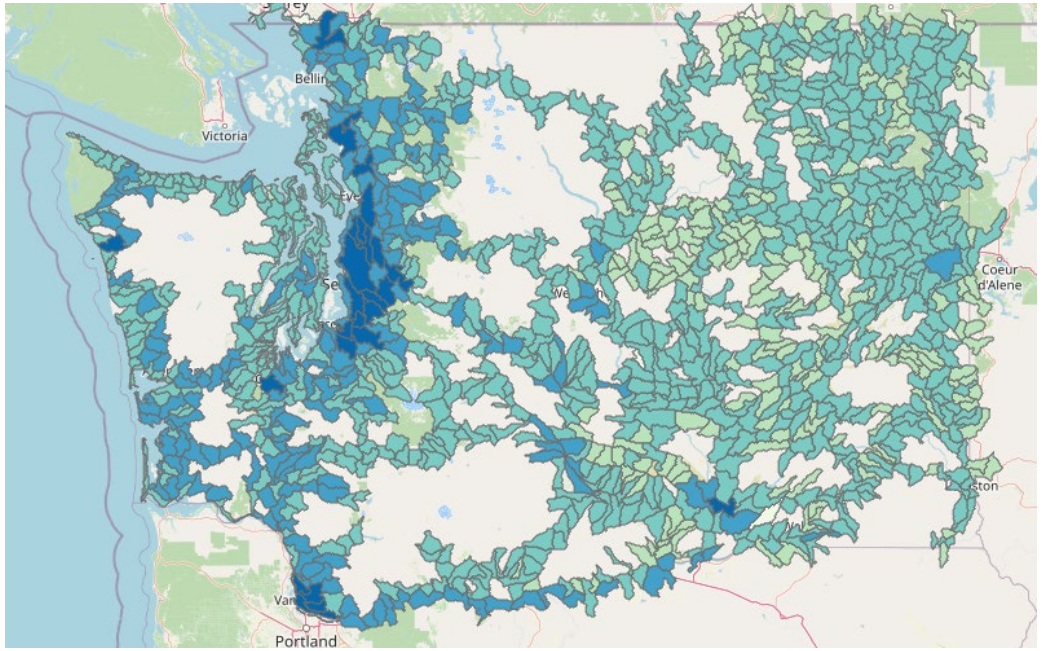
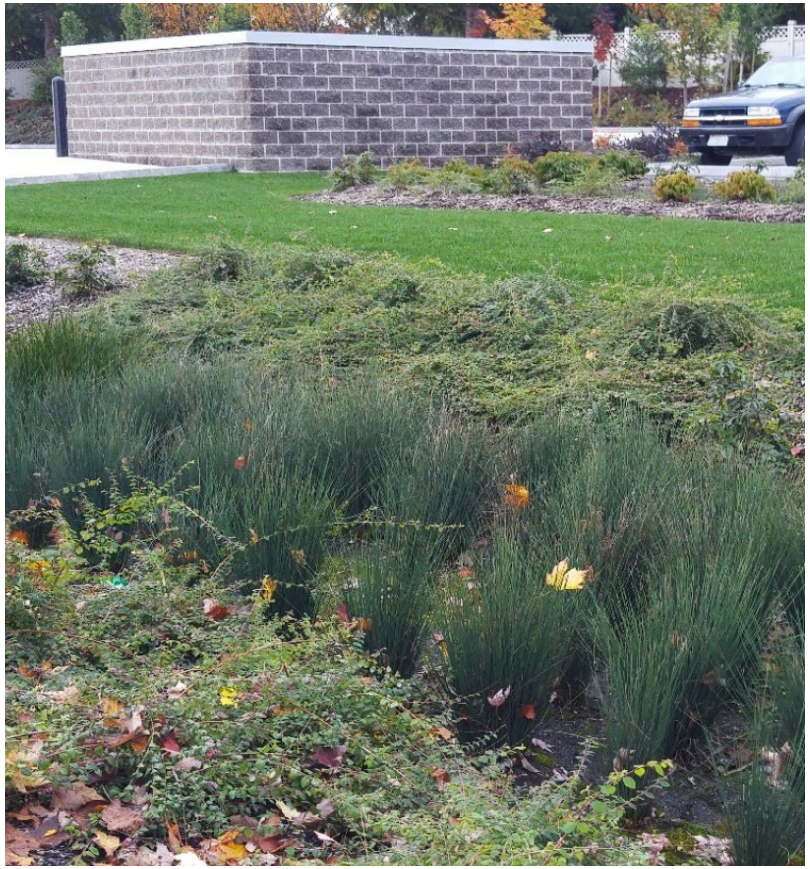


Photo: Washington State Department of Ecology

Types of Stormwater BMPs

Source Control



Flow Control

Runoff Treatment

Photos: BioCycle 2021, Washington State Department of Ecology

BMP Research

- Longevity of bioretention media
- Soils and sorbents effectiveness
- Street sweeping effectiveness

Photo: Washington State Department of Transportation

Compost Amended Bioswales

- Ongoing study at Washington State University Stormwater Center
- "CAB" - Layering of topsoil, compost, grass
- Water contaminated with 6PPD-q
- Cycling water to represent 10 years of use and exposure
- <u>Prevention of coho mortality</u>

Photo: McIntyre, Washington State University

Alternatives

Chemical	GreenScreen® Benchmark Score
6PPD (#793-24-8)	BM-1
77PD (#3081-14-9)	BM-2
CCPD (#4175-38-6)	BM-1
IPPD (#101-72-4)	BM-1
7PPD (#3081-01-4)	BM-1
TMQ (#26780-96-1)	BM-2
6QDI (#52870-46-9)	BM-1
NBC (#13927-77-0)	BM-1
Ethoxyquin (#91-53-2)	BM-2
Dilauryl thiodipropionate (#123-28-4)	BM-3 with data gap

BM-1: Avoid - Chemical of High Concern

BM-2: Use - but search for safer substitutes

BM-3: Use - but still opportunity for improvement

Environmental Justice Considerations

- Communities near roadways
  - Lower-income
  - People of color
- Food safety of fish consumption
- Drinking and recreational water safety
- Recycled rubber products
- Socioeconomic impacts
- Cumulative

Tribal Government Considerations

- Tribal Treaty Rights
  - Fishing rights
- Traditional foods
- Cultural and economic
- Hatcheries
- Sublethal impacts
- Cumulative impacts

Photo: Wade Smith,
Washington Department of Fish and Wildlife

Sampling & Analysis

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Sampling & Analysis

Environmental Science & Technology Letters

pubs.acs.org/journal/estlcu

Letter

6PPD-Quinone: Revised Toxicity Assessment and Quantification with a Commercial Standard

Zhenyu Tian,* Melissa Gonzalez, Craig A. Rideout, Haoqi Nina Zhao, Ximin Hu, Jill Wetzel, Emma Mudrock, C. Andrew James, Jenifer K. McIntyre, and Edward P. Kolodziej*

Cite This: https://doi.org/10.1021/acs.estlett.1c00910

Read Online

Tian, et al., Environ. Sci. Technol. Lett. 2022, 9, 2, 140–146

Comparison of the Toxicity of 6PPD-Q to Coho Salmon with Those of the Most Toxic Chemicals for Which the U.S. Environmental Protection Agency Has Established Aquatic Life Criteria[a]

Chemical Class	Name	Most Sensitive Species	LC50 (ppb)	95% CI	Ref	CMC (ppb)	EPA document
OP	Parathion	Orconectes nais	0.04	0.01−0.2	25	0.065	EPA 440/5-86-007
Quinone	6PPD-Q	Oncorhynchus kisutch	0.10	0.08−0.11	this study	not available	not available
OC	Mirex	Procambaris blandingi	0.10	not reported	26	0.001	EPA 440/5-86-001
OP	Guthion	Gammarus fasciatus	0.10	0.073−0.014	25	0.01	EPA 440/5-86-001
OP	Chlorpyrifos	Gammarus lacustris	0.11	not reported	27	0.083	EPA 440/5-86-005
OC	Endrin	Perca f lavescens	0.15	0.12−0.18	28	0.086	EPA 820-B-96-001
OC	4,4′-DDT	Orconectes nais	0.18	0.12−0.30	25	1.1	EPA 440/5-80-038
OP	Diazinon	Ceriodaphia dubia	0.25	not reported	29	0.17	EPA-822-R-05-006
Metal	Cadmium	Oncorhynchus mykiss	0.35	not reported	30	1.8	EPA-820-R-16-002
OC	Methoxychlor	Orconectes nais	0.50	0.25−1.8	25	0.03	EPA 440/5-86-001
OC	Dieldrin	Pteronarcella badia	0.50	0.37−0.67	28	0.24	EPA 820-B-96-001
OP	Malathion	Gammarus fasciatus	0.76	0.63−0.92	25	0.1	EPA 440/5-86-001
OC	Toxaphene	Ictalurus punctatus	0.8	0.5−1.2	31	0.73	EPA 440/5-86-006

[a]The rationale for the toxicity comparison can be found in SI text. Abbreviations: OP, organophosphate; OC, organochlorine; CMC, criterion maximum concentration; CI, confidence interval.

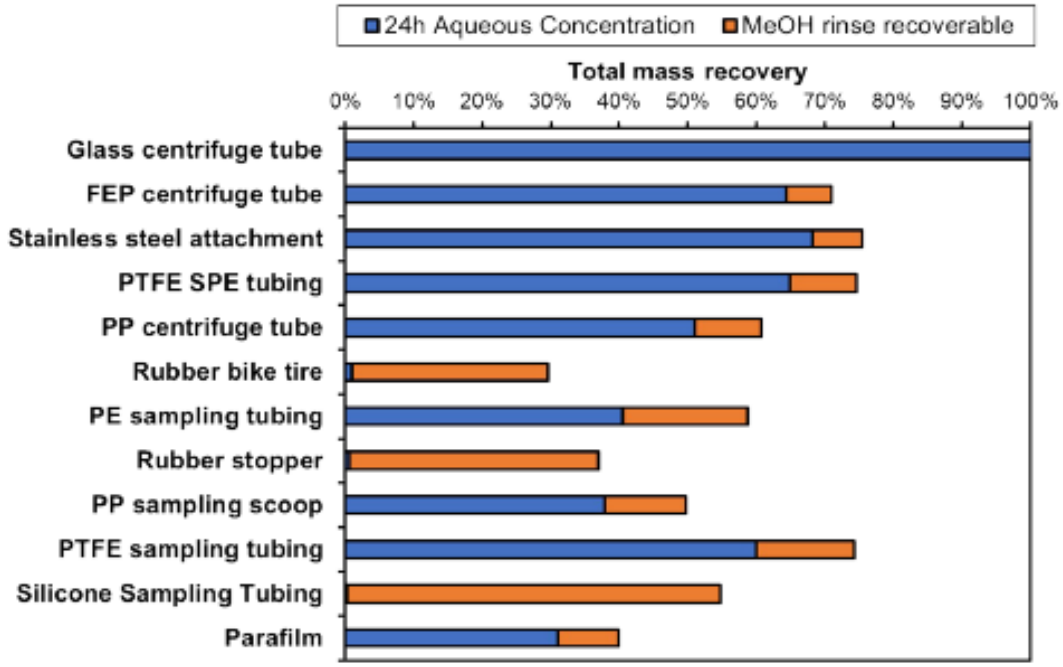
(25) Sanders, H. O. Toxicity of some insecticides to four species of malacostracan crustaceans; U.S. Department of the Interior, Fish and Wildlife Service, 1972; Vol. 66.
(26) Ludke, J. L.; Finley, M.; Lusk, C. Toxicity of mirex to crayfish, Procambarus blandingi. Bull. Environ. Contam. Toxicol. 1971, 6 (1), 89−96.
(27) Sanders, H. O. Toxicity of pesticides to the crustacean Gammarus lacustris; U.S. Fish and Wildlife Service, 1969.
(28) Mayer, F. L.; Ellersieck, M. R. Manual of acute toxicity: interpretation and data base for 410 chemicals and 66 species of freshwater animals; U.S. Department of the Interior, Fish and Wildlife Service, 1986.
(29) Norberg-King, T. J. Toxicity Data on Diazinon, Aniline, 2,4- Dimethylphenol. In Memo to C. Stephan; U.S. Environmental Protection Agency: Duluth, MN, and Superior, WI, 1987.
(30) Mebane, C. A.; Dillon, F. S.; Hennessy, D. P. Acute toxicity of cadmium, lead, zinc, and their mixtures to stream-resident fish and invertebrates. Environ. Toxicol. Chem. 2012, 31 (6), 1334−1348.
(31) Johnson, W. W.; Julin, A. M. Acute toxicity of toxaphene to fathead minnows, channel catfish, and bluegills; Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, 1980.

6PPD-Quinone: Revised Toxicity Assessment and Quantification with a Commercial Standard, Zhenyu Tian, et al., Environ. Sci. Technol. Lett. 2022, 9, 2, 140–146

Sampling & Analysis

Matrix Type	Minimum sample size	Sample collection containers	Storage conditions	Holding times
Surface water, groundwater, potable water, leachate, & road run-off	250 mL	Amber glass bottles with Teflon lined caps. No preservative.	≤6 ºC, protected from light	Analyse as soon as possible. Formal holding times have not been established but a conservative 7 days currently used.
Saline water	250 mL			
Solids (Sediment, Tyre crumb)	5 g	Amber glass jars with Teflon lined lids. No preservative.	≤ -20 ºC, protected from light	

Sampling & Analysis



Total solvent-recoverable mass of 6PPDQ from containers and test materials after 24 h sorption test. Values represent averages from experimental triplicates. Chemical characteristics, leaching, and stability of the ubiquitous tire rubber-derived toxicant 6PPD-quinone., Ximin Hu, et al., Environmental Science: Processes & Impacts, Issue 5, 2023

Sampling & Analysis

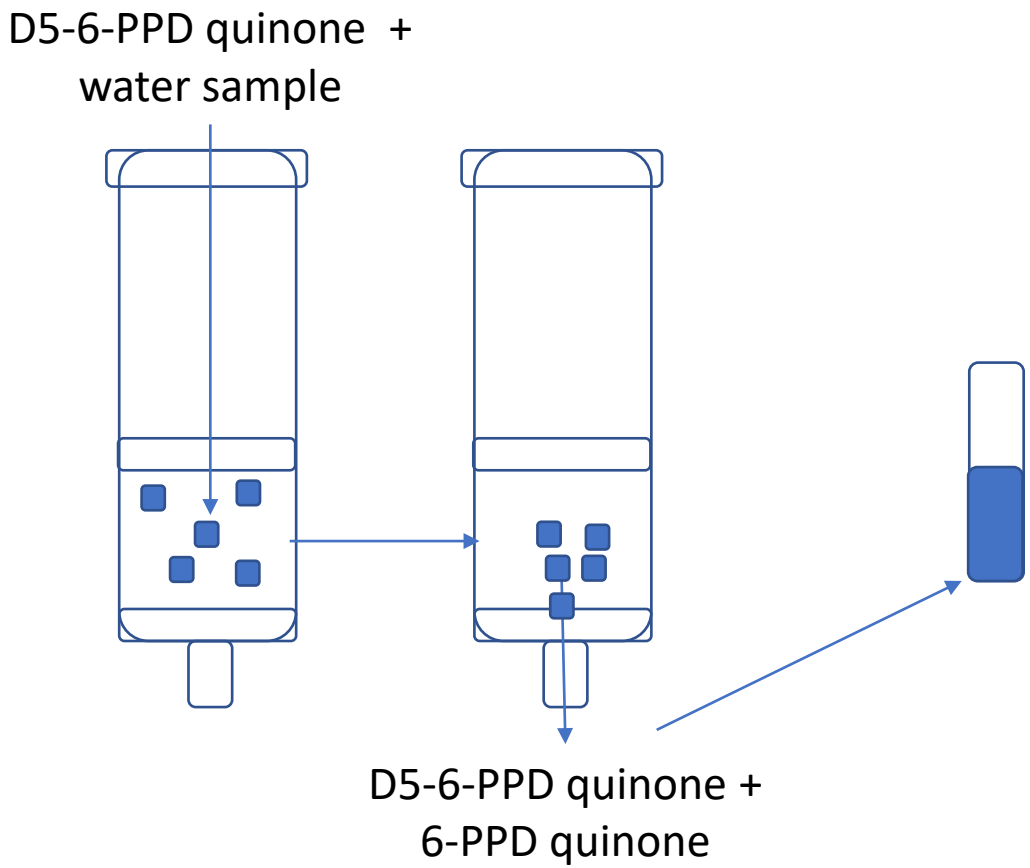
- The water solubility of 6PPD reported in the literature is variable but ranges from 0.5 to 2 mg/L (Klöckner et al. 2020; ECHA 2021a; Hiki et al. 2021).
- This variability may be due to 6PPD's high susceptibility to hydrolysis and short half-life in water.
- Regardless of the observed variability, 6PPD's water solubility is low

Sampling & Analysis

Selected physicochemical properties of 6PPD-quinone. Values are predictions from the U.S. EPA's EPI Suite software (U.S. EPA 2021b) unless otherwise noted

Property	6PPD-quinone	6-PPD
Molecular weight	298.39 g/mol	268.404 g/mol
Vapour pressure	Negligible at 25°C	0.004 Pa (25°C)
Melting point	169.18°C	163°C
Boiling point	430.19°C	260°C at 760 mm Hg, calculated 354-412°C (U.S. EPA 2021a)
Water solubility	51.34 mg/L at 25°C (U.S. EPA 2021b) 0.067 ± 0.05 mg/L (Hiki et al. 2021)	1 mg/L (50°C) (Klöckner et al. 2020; PubChem 2021; ECHA 2021) 0.563 ± 0.204 µg/L (Hiki et al. 2021)
Log K_{ow}	3.98 (U.S. EPA 2021b), between 5 and 5.5 (Tian et al. 2021)	Estimated value 4.68 (OSPAR Commission 2006; Klöckner et al. 2020)
Log K_{oc}	3.928	4.84
Half-life (Hiki et al. 2021)	33 hours at 23°C in dechlorinated tap water	five hours

Sampling & Analysis

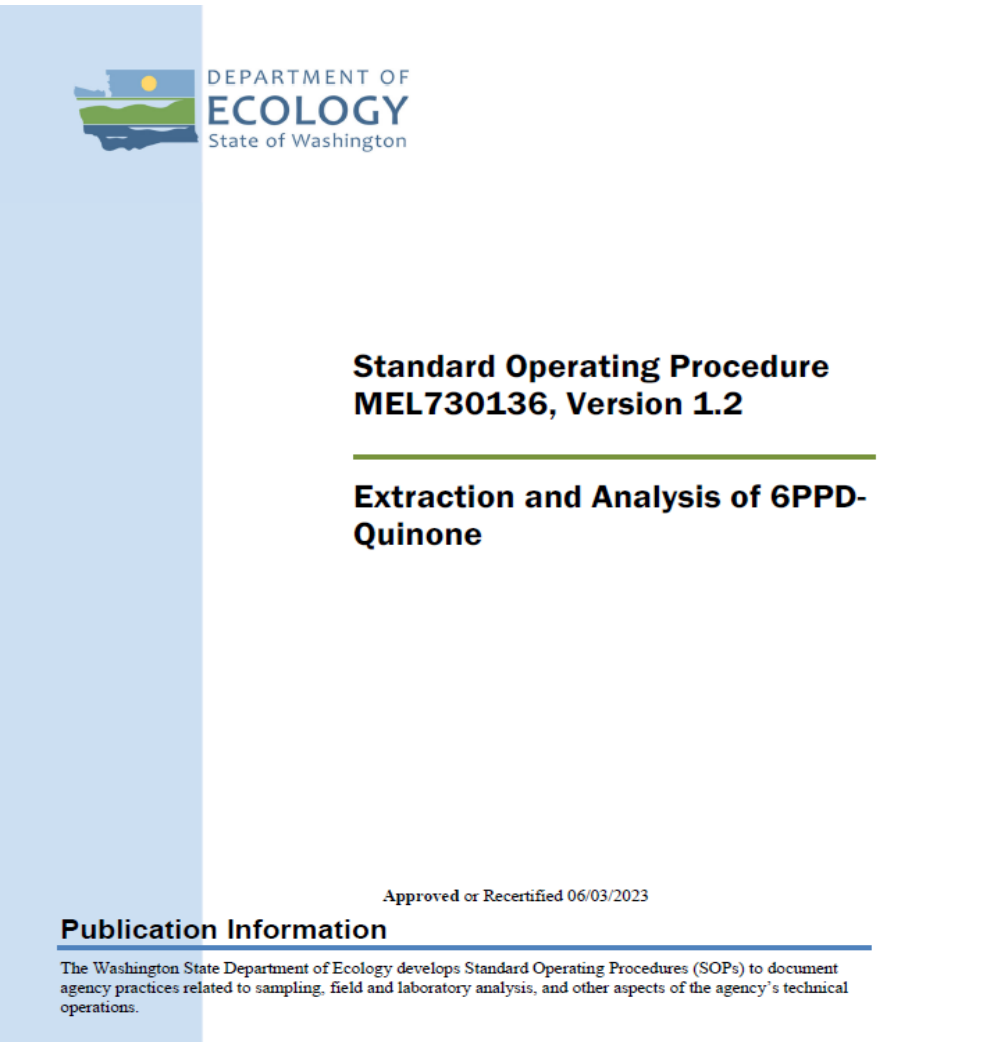


Solid-Phase Extraction (SPE)

Isotope Dilution Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

Sampling & Analysis

EPA United States Environmental Protection Agency



DEPARTMENT OF ECOLOGY
State of Washington

Standard Operating Procedure MEL730136, Version 1.2

Extraction and Analysis of 6PPD-Quinone

Approved or Recertified 06/03/2023

Publication Information

The Washington State Department of Ecology develops Standard Operating Procedures (SOPs) to document agency practices related to sampling, field and laboratory analysis, and other aspects of the agency's technical operations.

INTERSTATE COUNCIL ITRC TECHNOLOGY REGULATORY

ECOS

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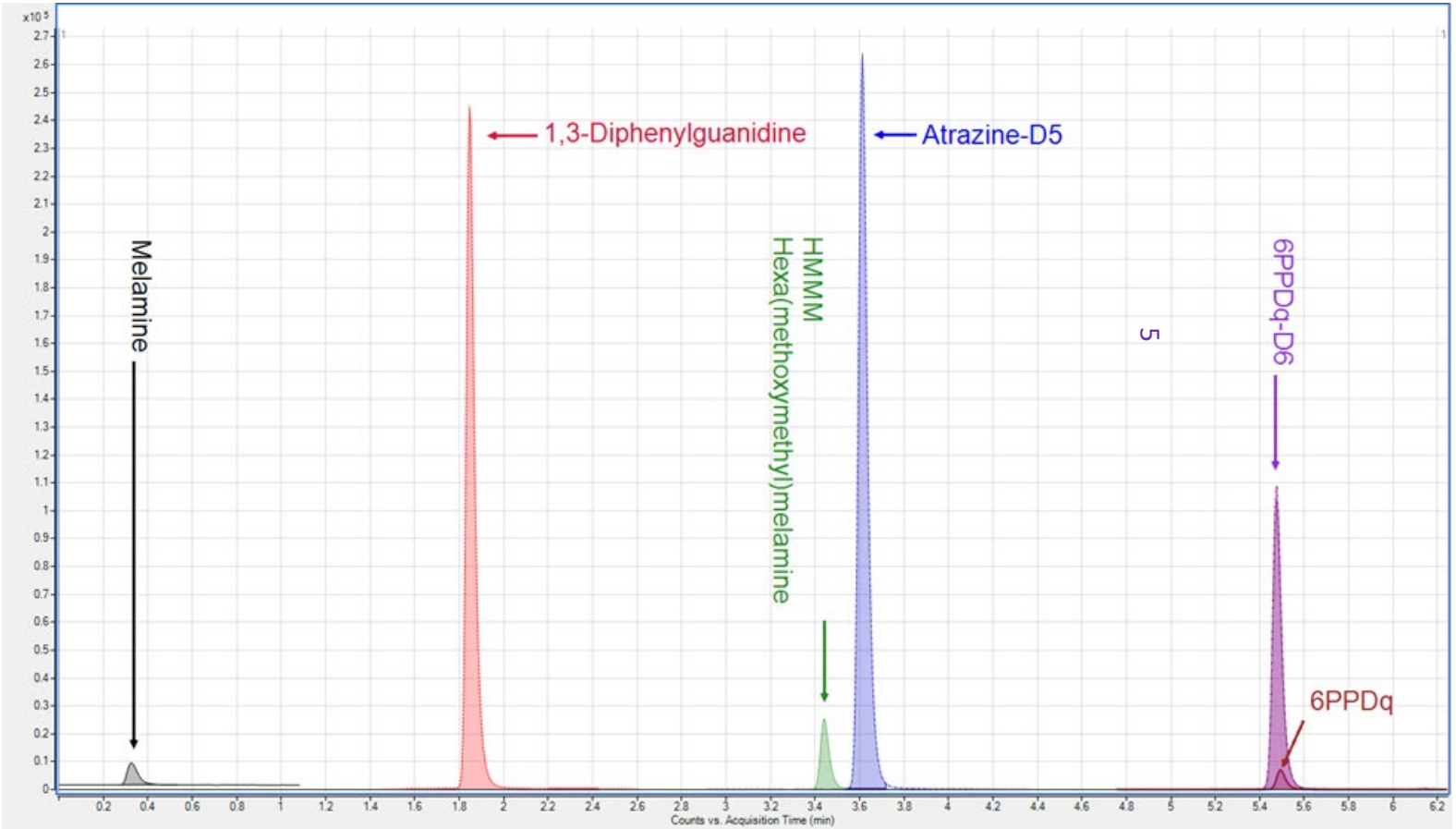
Sampling & Analysis



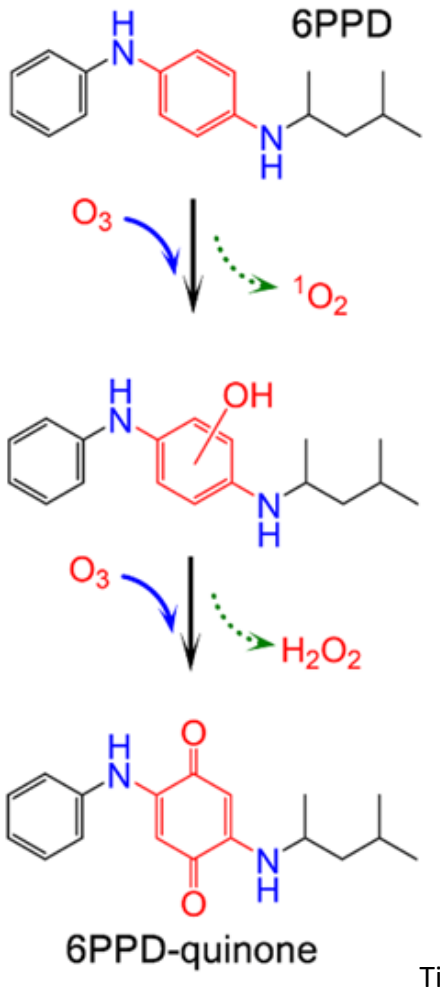
Sampling & Analysis

Matrix Type	Reporting Levels		
	6-PPD Quinone	HMMM	1,3-DPG
Surface water, groundwater, potable water, leachate, & road run-off	0.0001 µg/L	0.05 µg/L	0.001 µg/L
Solids (Sediment, Tyre crumb)	0.1 µg/kg	5 µg/kg	1 µg/kg

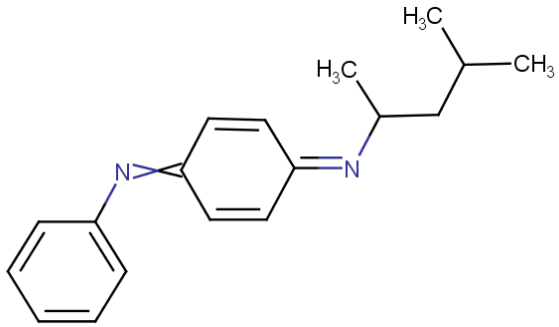
Sampling & Analysis

Liquid Chromatography-Quadrupole Time-of-Flight Mass Spectrometry (LC-QToF-MS)

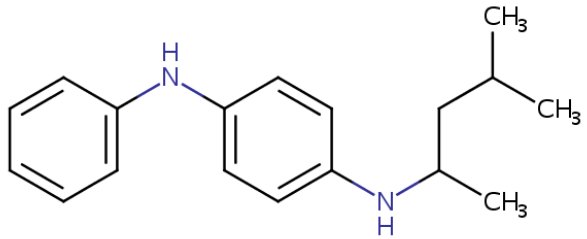
Sampling & Analysis



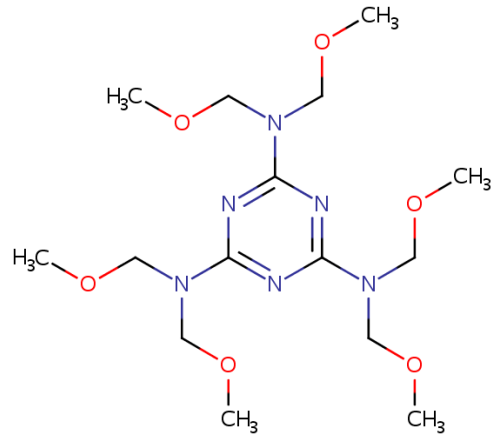
Tian et al. 2021



6-PPDQI (Benzenamine, N-[4-[(1,3-dimethylbutyl)imino]-2,5-cyclohexadien-1-ylidene]-)
CASRN 52870-46-9 | DTXSID00886023

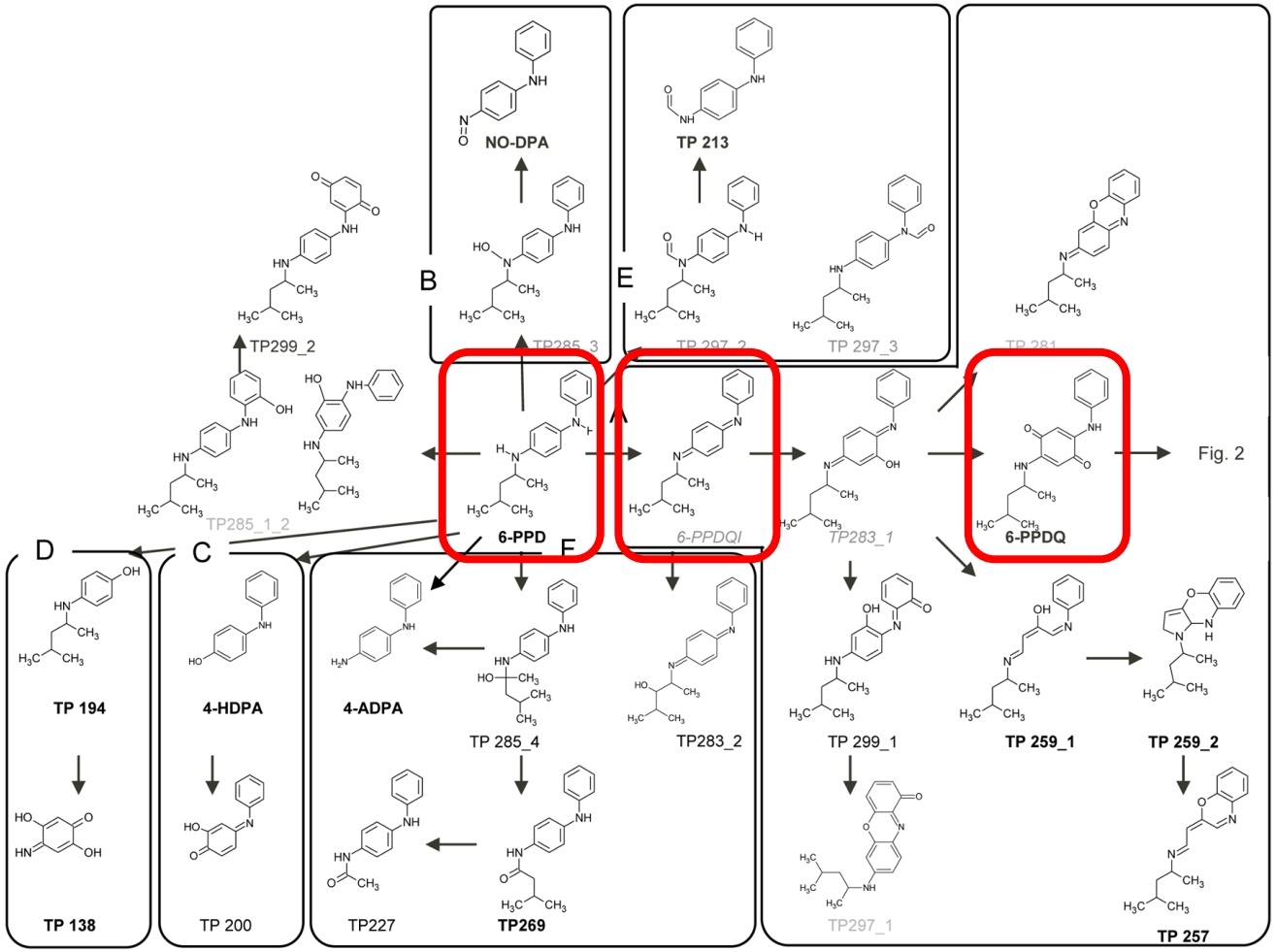


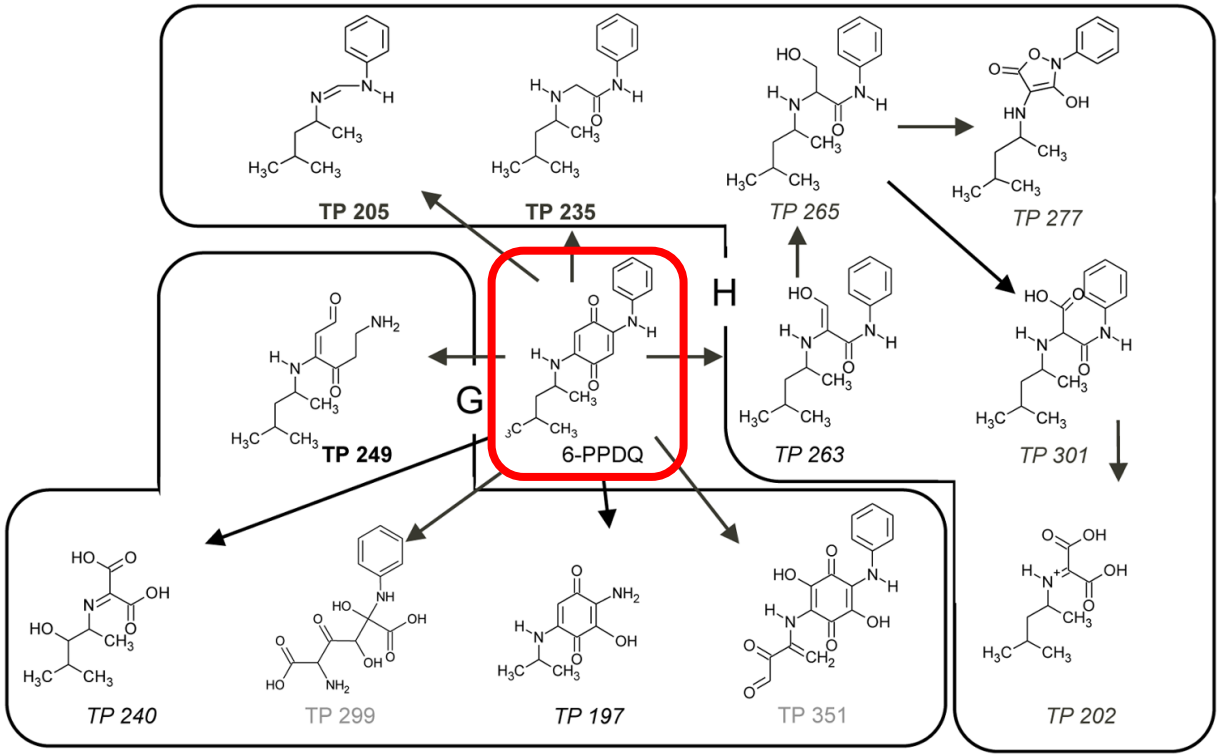
6-PPD [N1-(4-Methylpentan-2-yl)-N4-phenylbenzene-1,4-diamine
CASRN 793-24-8 | DTXSID9025114



HMMM (Hexa(methoxymethyl)melamine)
CASRN 3089-11-0 | DTXSID9027520

Sampling & Analysis





Abiotic oxidative transformation of 6-PPD and 6-PPD quinone from tires and occurrence of their products in snow from urban roads and in municipal wastewater., Seiwert et al., Water Research 212 (2022) 118122

6PPD-q in Wastewater

Lokesh Padhye
The University of Auckland
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6PPD-q in Wastewater

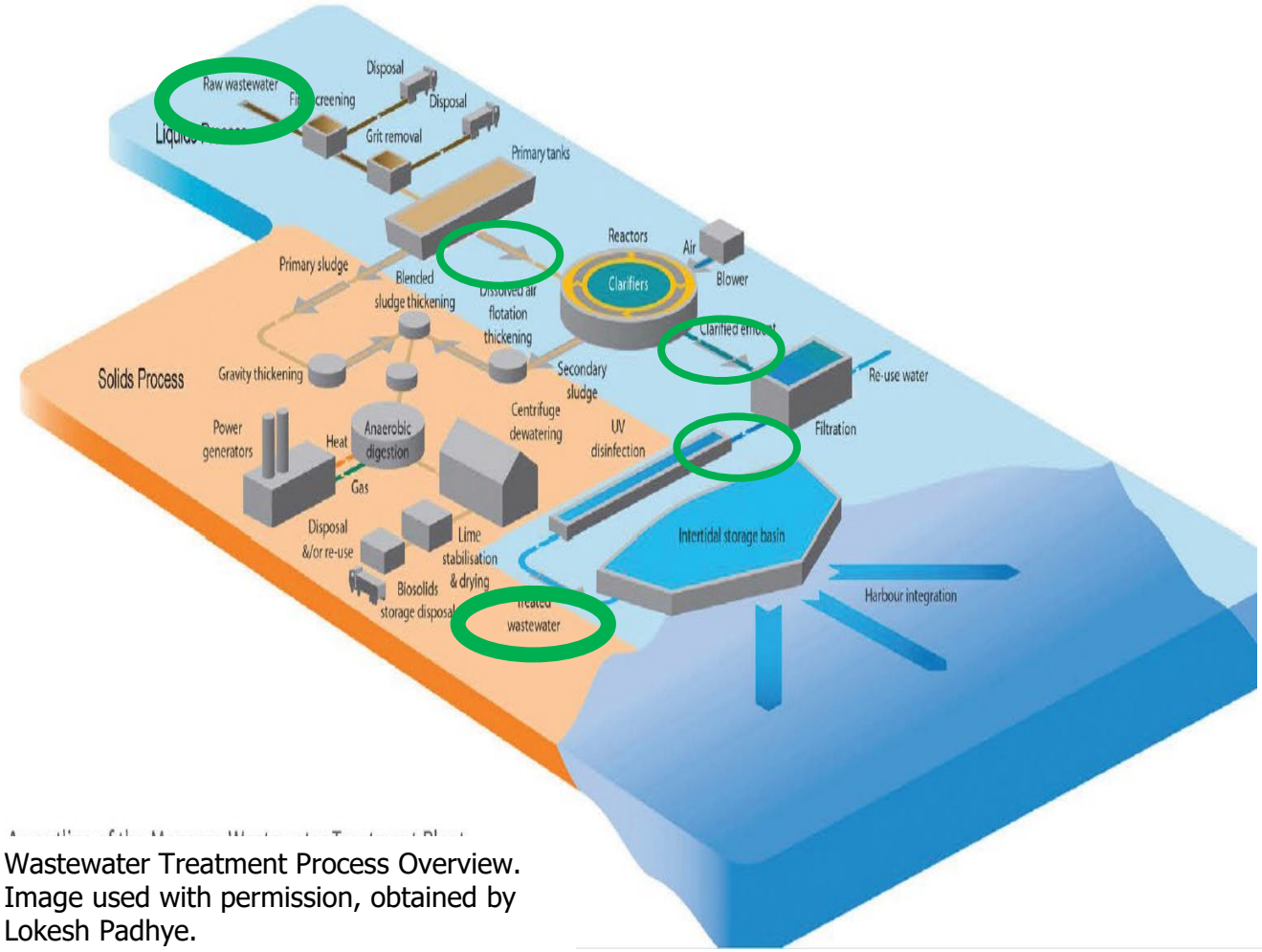
- How much of 6PPD-q arrives at and leaves from municipal wastewater treatment plants (WWTPs) receiving road runoff?
  - Role of combined sewers
  - Concentrations at different stages of wastewater treatment
- One of the first studies by Seiwert et al. (2022)

	6-PPDQ				6-PPD and TPs [a]			
	Concentration (µg/L)		Load (g/d)		Estimated total concentration (µg/L)		Estimated total load (g/d)	
Day	influent	effluent	influent	effluent	influent	effluent	influent	effluent
Snowmelt	0.105 ± 0.037	n.d.[b]	25.8	<6.2	4.4	2.4	1082	601
Rainfall	0.052 ± 0.022	n.d.[b]	7.3	<3.5	14.3	11.2	2001	1565
Dry weather	n.d.[b]	n.d.[b]	<5.4	<5.4	0.9	0.3	188	66

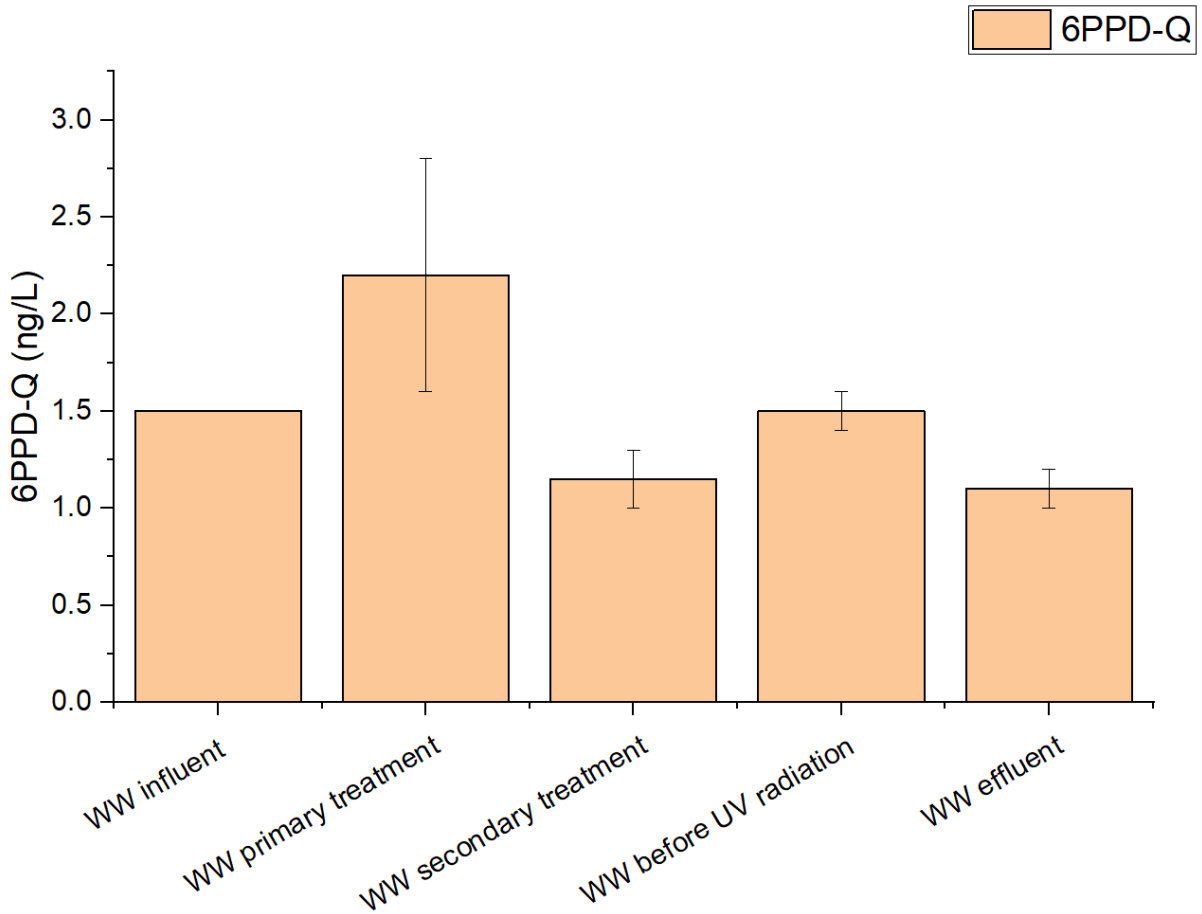
a) Estimated from their total peak area and the calibration curve of 6-PPD.

b) n.d.: not determined. LOQ approx. 15 ng/L for 4-HDPA and 25 ng/L for 6-PPDQ.

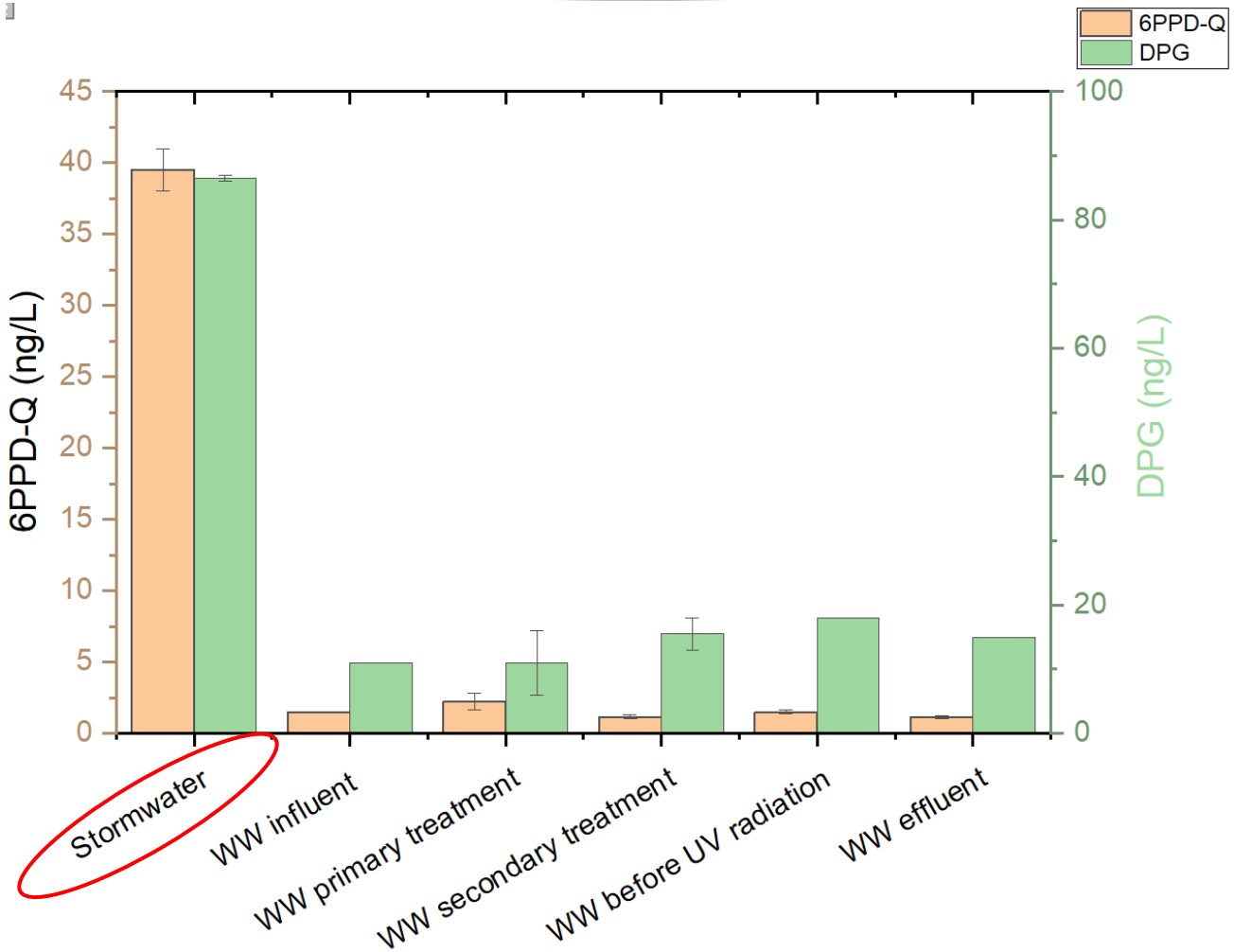
6PPD-q in Wastewater

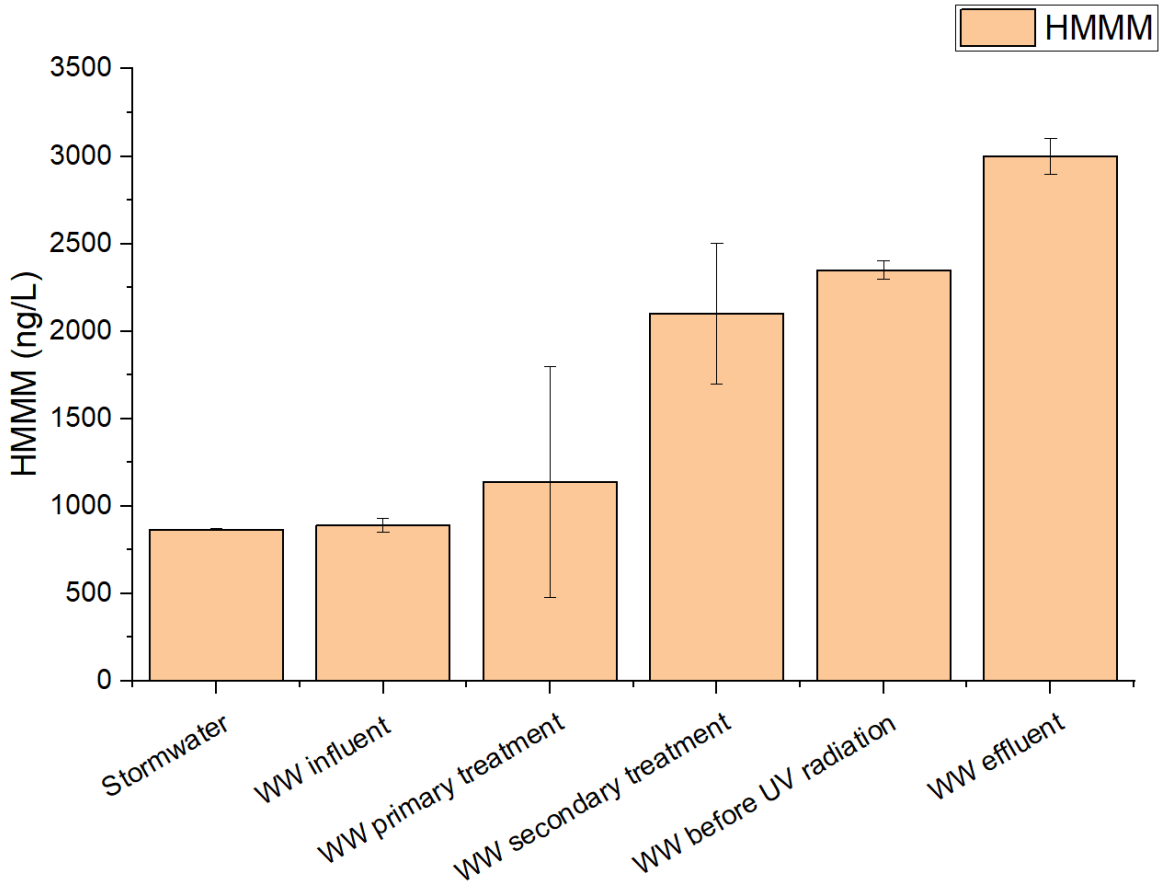


Wastewater Treatment Process Overview. Image used with permission, obtained by Lokesh Padhye.



6PPD-q in Wastewater





Acknowledgements – Mahyar Ghanadi (PhD student at the University of Auckland)

6PPD-q in Wastewater

- A paucity of studies on the fate of 6PPD-q in wastewater
- 6PPD-q detected in wastewater, but reported concentrations are lower than those in road runoffs and depend on several factors
- Wet weather concentrations are higher, implying not many other sources of 6-PPD in wastewater than road runoffs
- Treatment efficiencies are challenging to ascertain due to the complexity of reactions involving transformations of parent compounds and intermediates

Ecological Toxicity & Human Health

Kelly Grant, Ph.D.
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Species-Specific Acute Toxicity in Salmonids

Species	LC_{50} (µg/L)	Test duration (h)
Coho salmon *(Oncorhynchus kisutch)*	**0.08 (median)**	**24**

≥ 2.8 µg/L

Johannessen et al, 2021

Species-Specific Acute Toxicity in Salmonids

Species	LC_{50} (µg/L)	Test duration (h)
Coho salmon *(Oncorhynchus kisutch)*	**0.08 (median)**	**24**
White-spotted char *(Salvelinus leucomaenis pluvius)*	**0.51**	**24**
Brook trout *(Salvelinus fontinalis)*	**0.59**	**24**

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Brook trout *(Salvelinus fontinalis)*	**0.59**	**24**
Rainbow trout/steelhead *(Oncorhynchus mykiss)*	**1.0 (median)**	**96**

Species-Specific Acute Toxicity in Salmonids

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Coho salmon *(Oncorhynchus kisutch)*	**0.08 (median)**	**24**
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Rainbow trout/steelhead *(Oncorhynchus mykiss)*	**1.0 (median)**	**96**
Chinook salmon *(Oncorhynchus tshawytscha)*	**82.1**	**24**

Species-Specific Acute Toxicity in Salmonids

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Coho salmon *(Oncorhynchus kisutch)*	**0.08 (median)**	**24**
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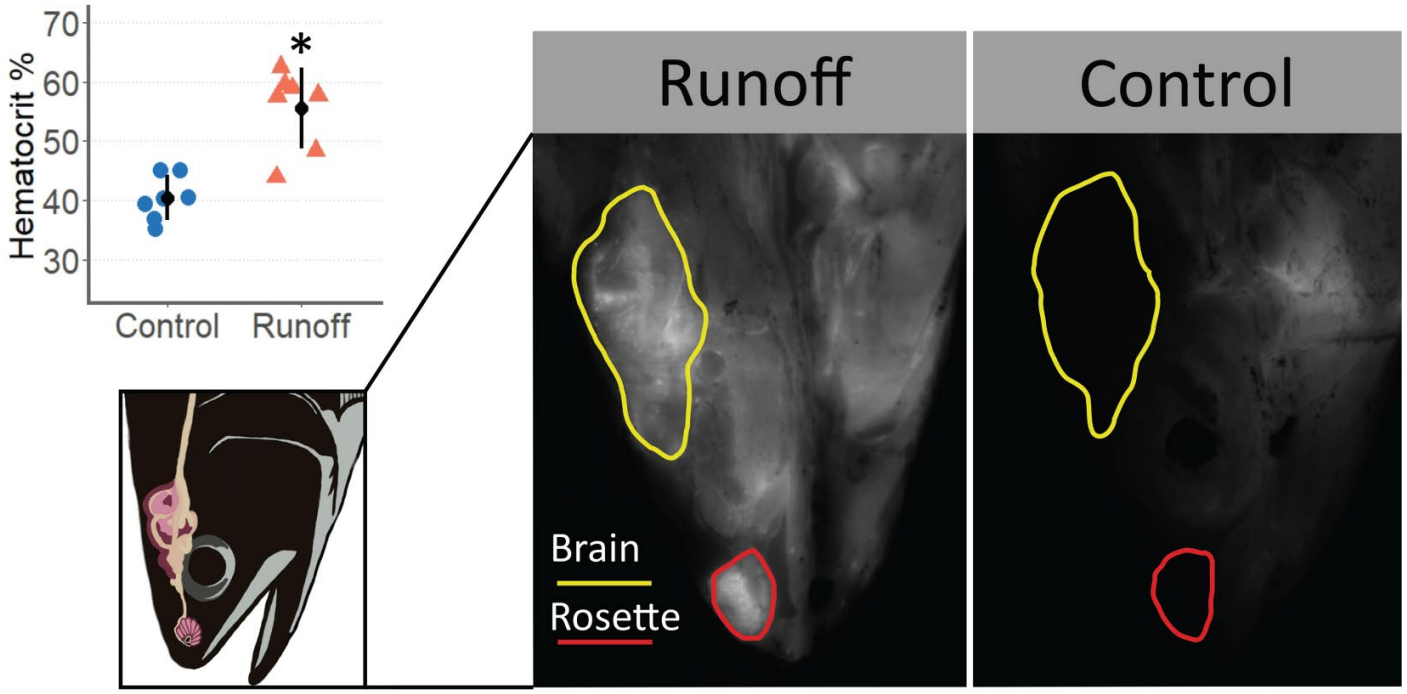
Brook trout *(Salvelinus fontinalis)*	**0.59**	**24**
Rainbow trout/steelhead *(Oncorhynchus mykiss)*	**1.0 (median)**	**96**
Chinook salmon *(Oncorhynchus tshawytscha)*	**82.1**	**24**
Sockeye salmon *(Oncorhynchus nerka)*	**Not acutely toxic at 50**	**24**
Atlantic salmon *(Salmo salar)*	**Not acutely toxic at 12.2**	**48**
Brown trout *(Salmo trutta)*	**Not acutely toxic at 12.2**	**48**
Arctic char *(Salvelinus alpinus)*	**Not acutely toxic at 12.7**	**24**

Not acutely toxic to: White sturgeon, zebrafish, medaka, fathead minnow, Daphnia, amphipod

Hypotheses for 6PPD-quinone's Mode of Action

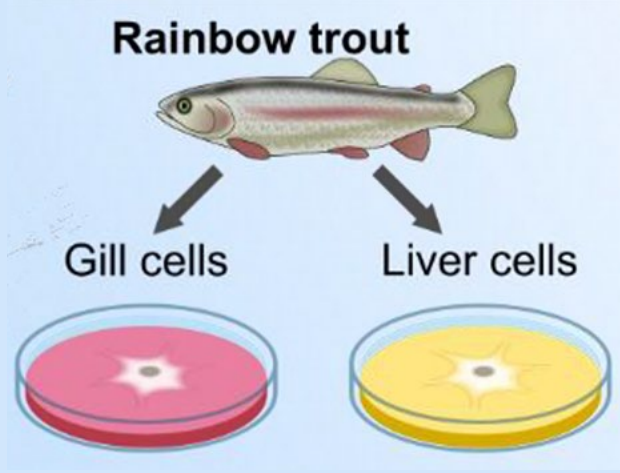
- Roadway runoff causes plasma leakage
  - Blood-brain barrier failure
  - Blair et al., 2020
- Dysregulated expression of genes important for blood vessel architecture
  - Greer et al., 2023
- Mitochondrial dysfunction
- Metabolism



Blair et al., 2020

Hypotheses for 6PPD-quinone's Mode of Action

- Roadway runoff causes plasma leakage
- Dysregulated expression of genes for vessel architecture
- Mitochondrial dysfunction
  - Mahoney et al., 2022
- Metabolism
  - Nair et al, in press
  - Montgomery et al, in press



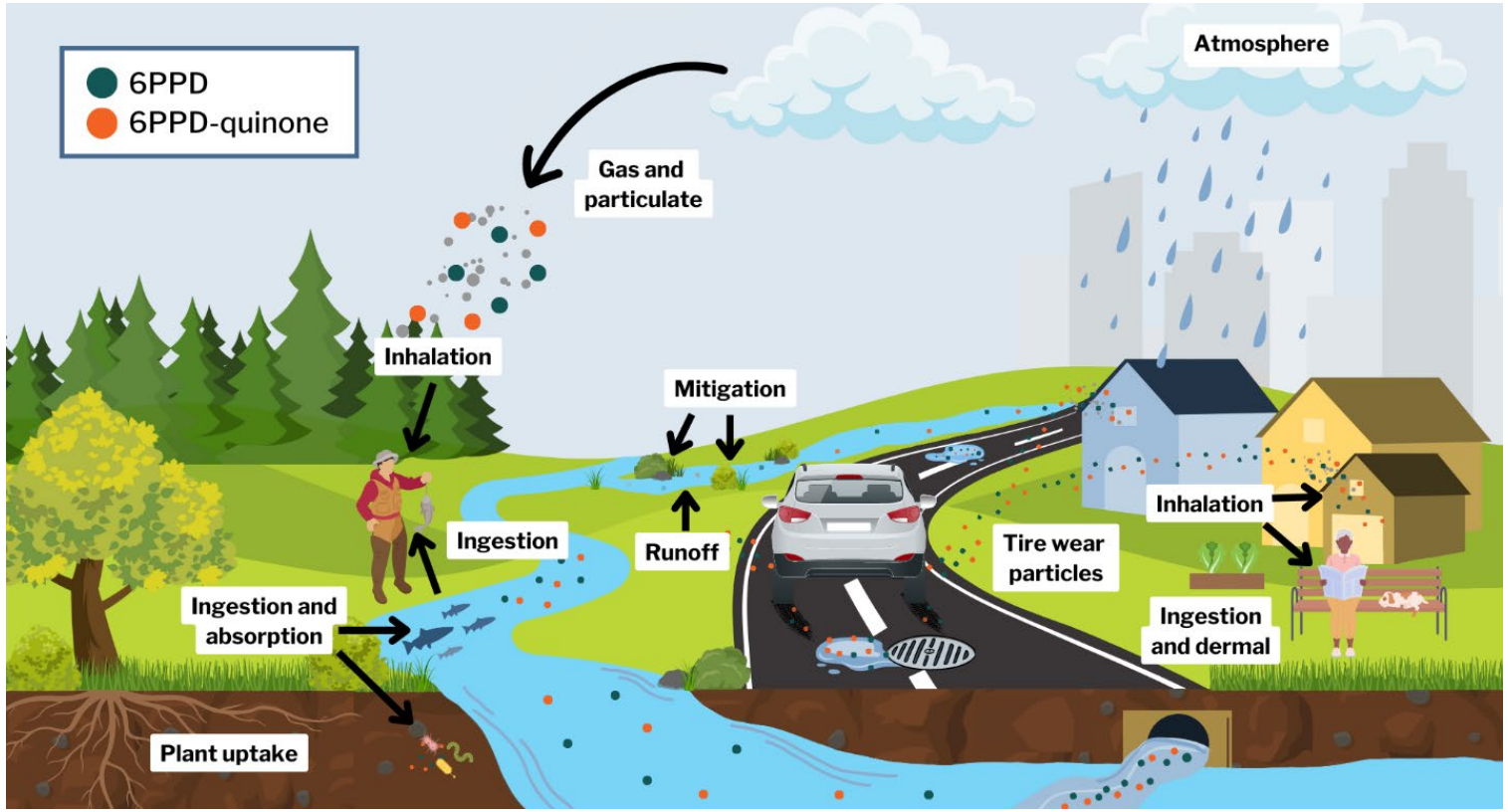
Cytotoxicity	☠	☺
Increased oxygen consumption rate	✓	✗
Biotransformation	✗	✓

6PPD-quinone developmental toxicity

- Expose coho episodically prior to hatching
- 17% of 0.9 µg/L-exposed fish died 5-8 d post-exposure
  - Youngest stages are more tolerant of 6PPD-q
  - Delayed mortality
- 0.9 µg/L caused reduction in eye area & total length
- Greer et al, 2023

Photo: Florian Graner, USFWS

Human Exposure to 6PPD-quinone



- Du et al, 2022 detected 6PPD-q in human urine
- Pregnant women's urine had higher levels
  - Unclear whether greater exposure or differences in metabolism

6PPD-quinone: human hazard traits

Exposure-potential hazard traits

- Insufficient information on bioaccumulation in mammals
- Transmitted through the placenta (Zhao et al, 2023)
- Pass through the blood-brain barrier in adults and fetuses (Zhao et al, 2023)

Toxicological hazard traits

- Predicted to cause oxidative stress (Wang et al, 2022)
- Liver toxicity (Fang et al, 2023)
  - Dose dependent increase in lipid & triglycerides in mice gavaged with 10 mg/kg bw/d and above for 6 weeks

What We Know: 6PPD & 6PPD-quinone

Check out our Focus Sheet:

6ppd.itrcweb.org

Partner Perspectives

Status of 6PPD-q Policies & Responses

Current Status of European Chemical Legislation and potential Implications on 6-PPD use in products

Sophie Claes, (ERM), NICOLE

European Green Deal – Chemical Legislation

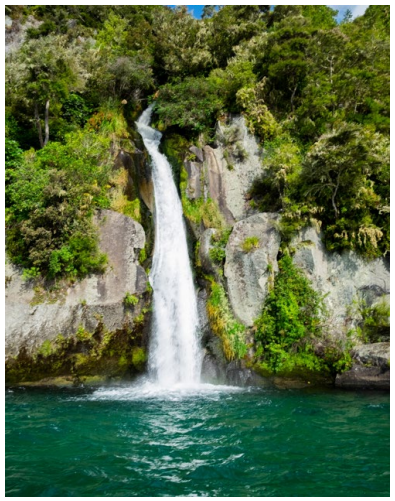
- The European Green deal (2019) is the EU's strategy to a climate neutral, clean and circular economy by 2050
- Includes a goal to improve protection of human health and the environment from hazardous chemicals and to move towards a toxic free environment
- Supported by two key policies:
  - Chemicals Strategy for Sustainability - CSS (2020)
  - EU Action Plan: "Towards Zero Pollution for Air, Water and Soil" (2021)
- Only "exploiting" chemical's benefits is allowed if no negative impacts on health and environment exist

European Commission

EU Chemical classification – How does it work ?

Under new regulations, EU chemicals will be assessed against five key hazard classes for classification and labelling:

- Endocrine disruption (**ED**)
  - Chemicals that may interfere with the hormonal system and thereby produce harmful effects
- Persistent, Bioaccumulative and Toxic (**PBT**) or very Persistent and very Bioaccumulative (**vPvB**)
  - Substances that last a long time in the environment and accumulate in biota having an adverse effect
- Persistent, Mobile and Toxic (**PMT**) or very Persistent and very Mobile (**vPvM**)
  - Substances that last a long time in the environment and accumulate in water having an adverse effect



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EUROPEAN CHEMICALS AGENCY

6 PPD – Current (and future) Status in Europe

Current State

- Registration database indicates that **6PPD** is toxic ("T") : Reproductive toxin / Aquatic toxin
- However, since ***6PPD is not yet classified as P (persistent) or M (mobile) (or vP or vM),*** the classification as Toxic has no significant impact on the registration for manufacturers who use 6PPD in their products
  - **6PPD is currently NOT a Substance of Very High Concern (SVHC) nor under any significant EU scrutiny**

Future state

- 6PPD (and transformation products (T.P.)) needs to be assessed against the hazard classes and the outcome could impact long-term use
- ***If 6PPD (or a T.P.) were classified as P and M***, the "T" classification ***would trigger identification as a Substance of Very High Concern (SVHC)***
- Endocrine disruption (ED) now must be assessed for industrial chemicals: ***if 6PPD is ED, this would trigger "SVHC"***
  - **If 6PPD is classified as PMT/vPvM or ED compound: 6PPD will be assessed for essential use with view to eventual replacement and withdrawal**

Hypothetical Timeline

- Member States can make a proposal for classification as of 20th April 2023
- 1st November 2026 is the mandatory date for new classification and labelling
- Classification of a substance in one of the five hazard classes will result in a proposal as a "SVHC compound to be assessed for restriction from the market"

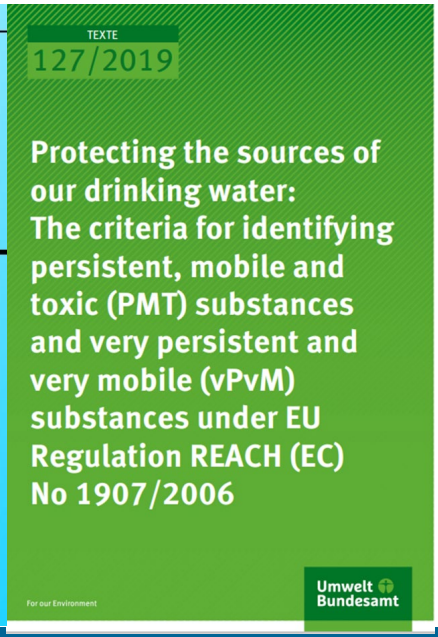
Increasing Detection of Industrial Chemicals in Monitoring Studies

- Significant regulatory focus on the monitoring of industrial chemicals in water resources
- Attention to 'emerging and new contaminants'
  - ~50% identified in water resources, were industrial chemicals
  - Potentially very difficult to remove from water during treatment processes
  - Potential long term health impacts
- Protection of water resources identified as a major policy driver
- Transition to "Safe and Sustainable by Design"

Research | Open Access | Published: 08 March 2022

Getting in control of persistent, mobile and toxic (PMT) and very persistent and very mobile (vPvM) substances to protect water resources: strategies from diverse perspectives

Sarah E. Hale, Michael Neumann, Ivo Schliebner, Jona Schulze, Frauke S. Averbeck, Claudia Castell-Exner, Marie Collard, Dunja Drmač, Julia Hartmann, Roberta Hofman-Caris, Juliane Hollender, Martin de Jonge, Thomas Kullick, Anna Lennquist, Thomas Letzel, Karsten Nödler, Sascha Pawlowski, Ninja Reineke, Emiel Rorije, Marco Scheurer, Gabriel Sigmund, Harrie Timmer, Xenia Trier, Eric Verbruggen & Hans Peter H. Arp



Australasian Land & Groundwater Association

Current Status of Regulations/Guidelines in Australia & New Zealand

Bob Symons, (Eurofins), ALGA

Lokesh Padhye (UoA), ALGA

eurofins

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DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

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Status of 6PPD-q & Regulations in Australia

- Australian Government Department of Climate Change, Energy, the Environment and Water operates the national Tyre Product Stewardship Scheme (TPSS)
- Tyre Stewardship Australia (TSA) manages this program
- Australia disposes of 506,000 tonnes of tyres each year
- A significant majority ends up in landfill.

Status of 6PPD-q & Regulations in New Zealand

- No current guidelines or regulations
- Listed on the New Zealand Inventory of Chemicals (NZIoC) by NZ EPA
- No approval under the Hazardous Substances and New Organisms Act (HSNO) but can be used under an appropriate group standard.
- 6PPD itself cannot be imported into NZ (or manufactured) but it can be imported when present as a component of a product

Acknowledgements – Peter Dawson (Principal Scientist, Environmental Protection Authority, New Zealand).

Current Status of Response in the United States

Tanya Williams, (WA ECY), ITRC

Responses to 6PPD-q in the U.S.

- U.S. EPA
  - Developing a validated method for measuring 6PPD-q in surface water
- Washington State
  - BMP effectiveness research
  - Alternatives Assessment: Hazards of 6PPD and Alternatives
  - 6PPD Action Plan
  - Proposed: Safer Products for Washington – 6PPD as a priority chemical
- California
  - Safer Consumer Products Program will require manufacturers to complete an Alternatives Analysis to investigate safer alternatives to 6PPD in tires

Facilitated Question & Answer

Source: Pixabay

Thank You!

Thank you for supporting this workshop!

- Visit **itrcweb.org** to learn more and join!
- Visit **landandgroundwater.com** to learn more and join!
- Visit **https://nicole.org/** to learn more and join!

Looking to future partnerships with ALGA in 2023!

ecoforum/**Sust**Rem – 10-13 October - Melbourne